

ABSTRACT OF THE DISCLOSURE

Rechargeable electrochemical cells, such as lithium
batteries and asymmetric hybrid battery/supercapacitor systems,
exhibiting exceptional specific capacity levels and stability
over extended high-rate recharge cycling comprise nanostructure
zero strain $\text{Li}_4\text{Ti}_5\text{O}_{12}$ intercalation electrode material synthesized
in a short duration process of annealing mixed TiO_2 and Li-source
precursor compounds at about 800°C for a time of about 15-30 min
which is not substantially longer than that required to effect
maximum available reaction between the precursors, thereby
substantially eliminating the growth of synthesized $\text{Li}_4\text{Ti}_5\text{O}_{12}$
particles beyond nanostructure size. The process reduces by
order of magnitude the time and energy required for synthesis of
the active electrode material and fabrication of utilizing cell
devices, and provides such nanostructure material which enables
repeated, high-rate recharge cycling without loss of cell
capacity or efficiency.